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AIR TRAFFIC ORGANIZATION

EUROCONTROL

Communications Operating Concept & Requirements (COCR)

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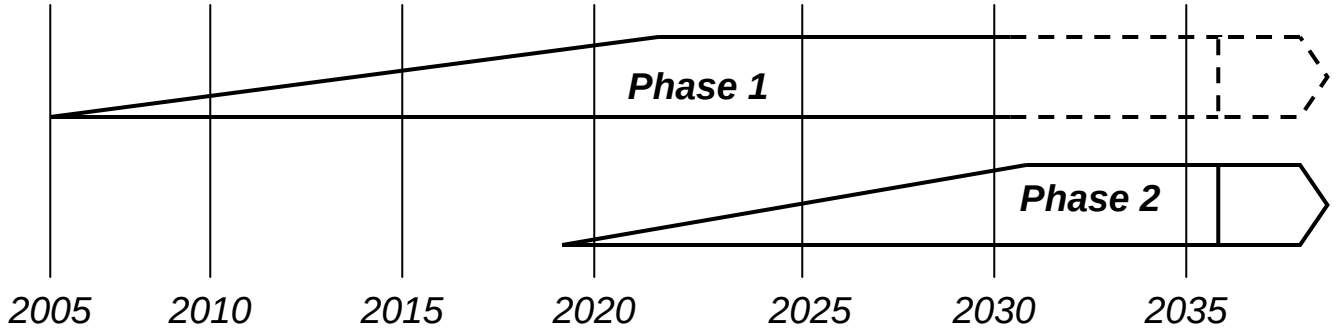
Historical

- **Combined Team of Operational & Technical experts established between FAA/EUROCONTROL May 2004.**
- **Two phased approach supporting AP-17.**
  - **Develop Initial COCR to support Technology Pre-Screening & Down Select.**
    - **Literature search for 2015 – 2030 Operating Concepts**
    - **Understand/Define/Describe Services**
    - **Establish Traffic Characteristics & Loading**
    - **Public Release April 2005**
  - **Develop COCR Version 1 to support Technology Selection.**
    - **Continued refinement of Initial COCR**
    - **Increase validity of requirements by modeling**
    - **Conduct Safety, Security, Performance Analysis**
    - **Public Release March 6, 2006**
- **Documents available on the following website**
  - **http://www.nas-architecture.faa.gov/nas5/downloads/home.cfm**

Operational Concepts described as Phases 1 & 2.

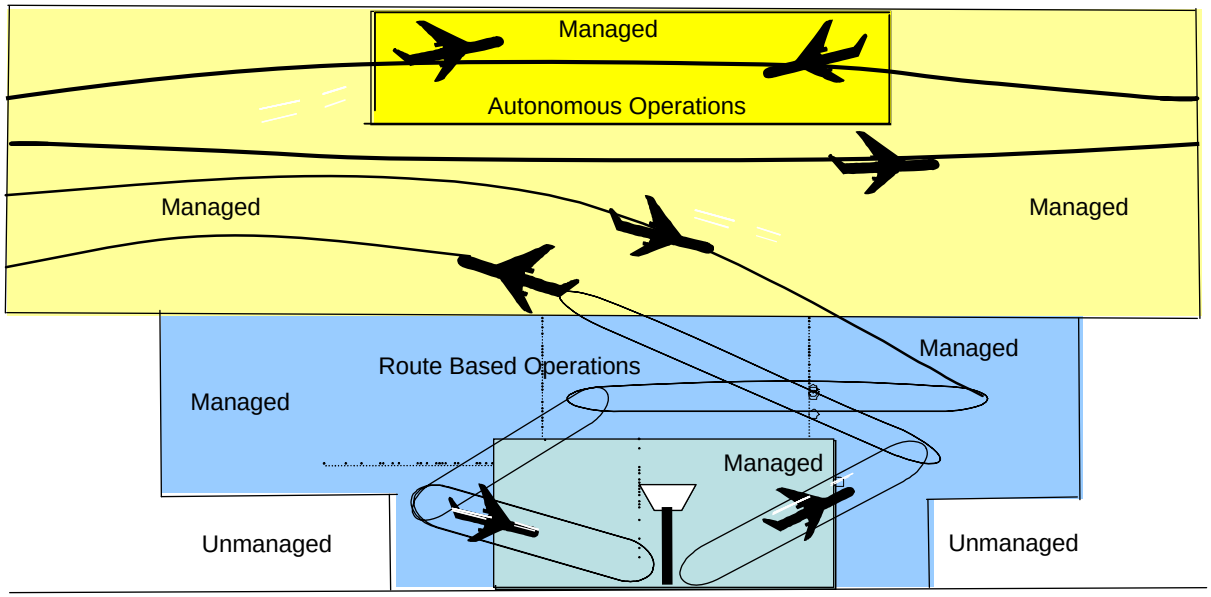
– **Phase 1 beginning now, maturing ~2020.**
  - Evolution of communications services from voice to data.
  - Operations begin the “paradigm shift” from “Management by Intervention” to “Management by Planning & Intervention by Exception”.

– **Phase 2 takes over through to 2030 & beyond.**
  - Evolution of communications services to support 4-D Trajectory Based Ops.
  - Autonomous Operations in designated airspace.
  - Air Traffic is Managed vs. Controlled.
  - Net Centric Operations allow air-ground flow of system wide information.

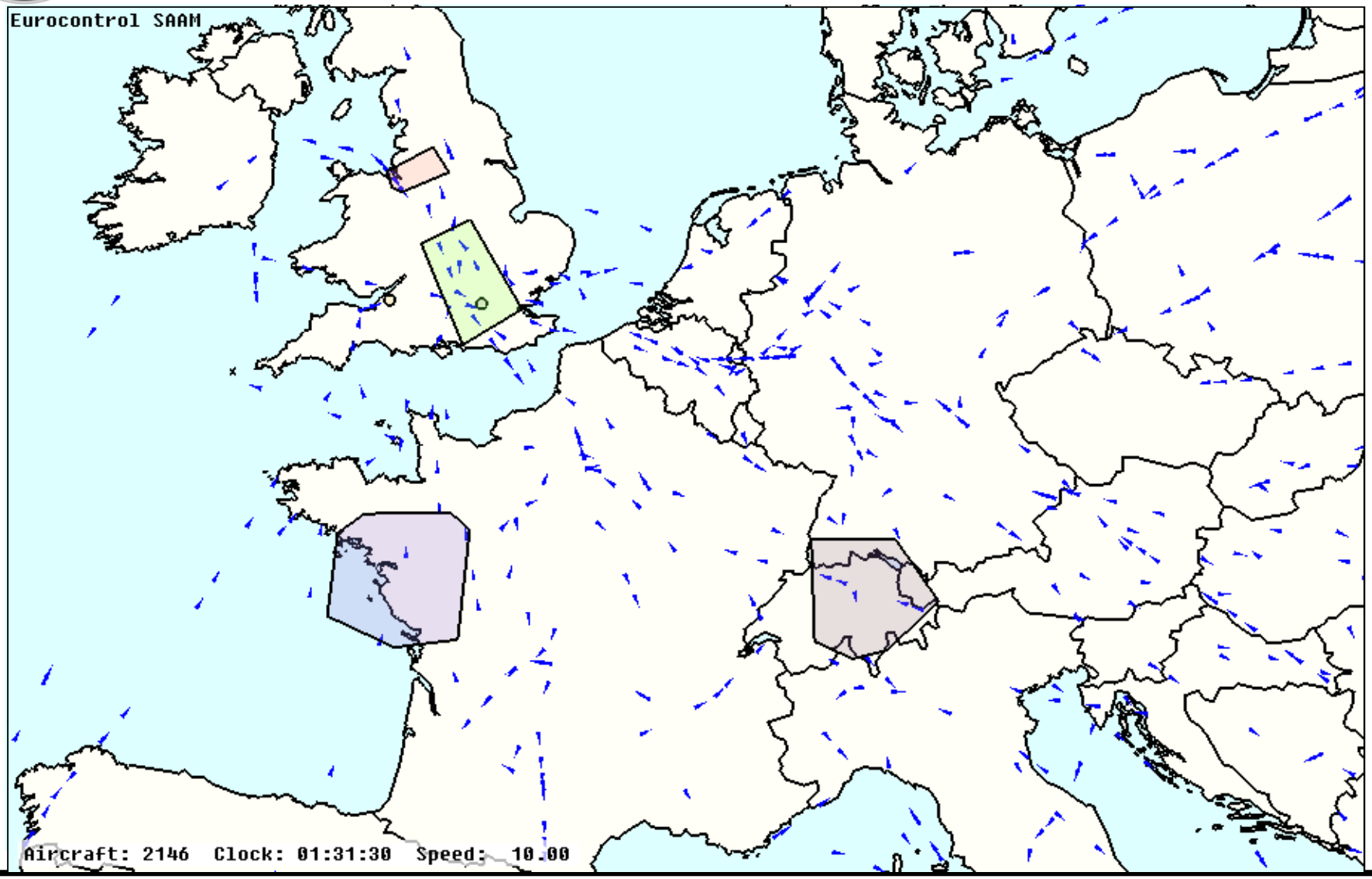


COCR Content Overview (con't)

- Two types of airspace exist in Phase 2:
  - Unmanaged Airspace: VFR uncontrolled airspace/airports included in this category.
  - Managed Airspace:
    - Traditional ATC, trajectory based ops, & instances of self separation & sequencing for limited duration
    - NEW: Autonomous airspace w/control exhibited upon entry/exit but, while in it user on own for conflict detection & resolution.



A Day in 2025



COCR Summary

- To develop the COCR, a seven step process was employed.
  - Initially, to determine the overall context for future communications, numerous Concepts of Operations, Vision Statements and Plans being developed and circulated by ANSP's around the world were reviewed. The first step was complete when a notional vision and universal operating concepts for air traffic management were developed.
  - Identification and definition of Air Traffic Services and Aeronautical Operational Control services that would be necessary to achieve the vision comprised the second step.
  - The operating environment, in which these services would be provided, was then defined to ensure all implications of each service were addressed.
  - Step four consisted of safety and security assessments for the air traffic services, which enabled step five's establishment of high-level requirements each service would have to meet (so that the specified outcome or benefit of the service could be achieved safely and efficiently) and allocation of those requirements to the Future Radio System.
  - Next, the voice and data capacity the FRS would require in order to deliver the services was calculated.
  - By walking through a few sample applications of the previous results, the seventh and final step attempted to put the COCR effort into perspective and facilitate future use.

COCR Summary (Con't)

- **Key points in the ATS concepts considered include:**
  - ASAS Operations are implemented in some airspace beginning in Phase 1, leading to Autonomous Operations in Phase 2.
  - Larger sectors were assumed in Phase 2 and become more dynamic in managed airspace.
  - Air Traffic Management begins using 4-D trajectory - based operations in managed airspace.
  - Automation becomes available to both ground and air users enabling longer range conflict resolution.
  - "Machine-to-Machine" information exchanges replace many Human-to-Human exchanges.
  - The controller's role is transformed to a management paradigm through various decision support tools.

COCR Summary (Con't)

- **Key Points in the definition of the operational services include:**
  - Some services can only be effectively delivered by data, including those that have extensive or complicated data streams, such as 4-D trajectories, or generate high workload due to repetition.
  - Elements of some services, such as tactical communications requiring near-immediate reaction, may only be effectively administered by voice.
  - Many services may be delivered by either means, such that workload or communications resource costs may be deciding factors of which media to use.
  - Some services e.g., A-EXEC may require alternate means, and while infrequently used, their availability may be required nonetheless.

COCR Summary (Con't)

- **Key points of the Safety Assessment include:**
  - The primary effect of the safety assessment was on parameters such as availability and integrity in the Phase 2 timeframe.
  - In an environment where separation standards are reduced, ground or airborne systems must have the capability to detect conflicts, provide resolutions, and in rare cases implement the resolutions e.g. auto execution of the required manoeuvre by the aircraft, **without human intervention**.
  - Further work is required to complete detailed safety, security and performance analyses for each service.

COCR Summary (Con't)

- **Key Findings of the Information Security Analysis include:**
  - The security requirements were undertaken on an end-to-end basis and therefore many of the security requirements are beyond outside the scope of the FRS.
  - One security requirement that is directly relevant to the FRS is the need for some level of deliberate RF interference resistance.
  - The FRS should have the ability to use message security features, such as message authentication, as needed to ensure safe delivery of services that require high integrity messaging.

COCR Summary (Con't)

- **Overall**
  - In terms of capacity, future ATS air/ground data requirements appear to be relatively modest. However, this problem has more than one dimension, as delivery of air traffic services requires simultaneous achievement of many, often challenging, requirements.
  - The safety-driven combination of capacity, integrity, reliability, latency and coverage requirements typically dictate unique solutions for aviation.
  - While Phase 2 requirements appear to be beyond the capabilities of systems currently deployed, numerous advanced technologies, as well as options for further evolution of today's most capable systems, should meet all but the most demanding needs.
  - To implement this two-phased vision affordably, careful examination of the services, especially those that drive requirements, will be necessary to balance costs and benefits.

COCR Summary (Con't)

- The remaining COCR tasks under AP-17 include:
  - ensuring satisfactory agreement among stakeholders with some of the more stringent services and the surrounding concept of their use along with capture and definition of missing services,
  - further definition of the services to ensure a more complete understanding of their operational use,
  - categorization of the services into groups based on likeness,
  - assessment of the safety and security requirements associated with each group, and
  - assessment of the associated performance requirements impact.
- The result of these tasks in concert with the technology assessment results will form the basis of the COCR Version 2 planned for publication in approximately March of 2007.